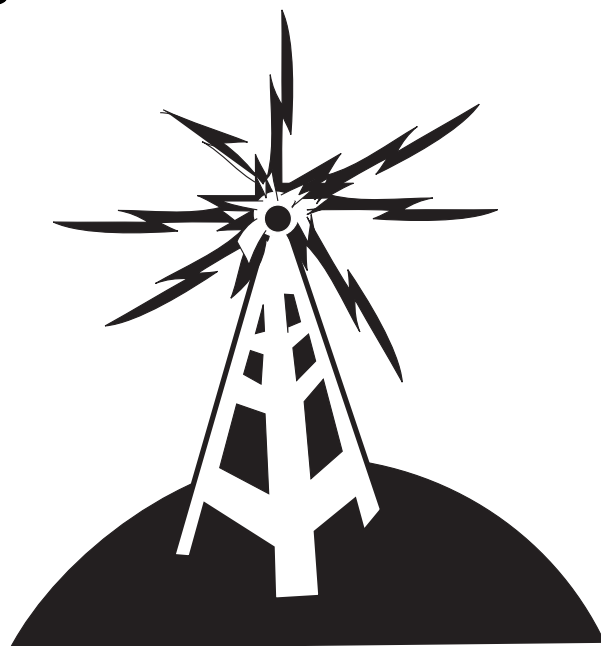


# AM/FM Radio Kit™



**RadioShack®**

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# INTRODUCTION

## ABOUT THIS RADIO KIT

The kit is perfect for children ages 8 and up, providing an excellent way to begin a hobby in electronics. You need only a couple of hours to put the parts together, gaining the benefit of hands-on learning. No soldering is required so you can make circuit changes very easily. The design of this radio kit is simple, but you will be amazed at its performance. You will need 4 AA alkaline batteries to operate your radio.

Radio circuits often require many electronic parts and complicated alignment procedures. This radio kit's tuning circuit, however, is pre-assembled and aligned at the factory. All you have to do is insert the spring terminals into the circuit diagram panel's terminal holes and connect the wires according to the wiring diagrams.

**Hint:** Read *all* of the instructions before you start assembling the radio. Ask an adult for help if you do not understand a particular step or process.

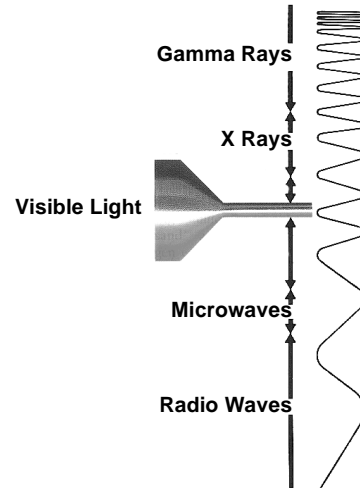
The experiments in this kit are designed to comply with FCC rules as long as you follow the instructions and use only the components and materials supplied with the kit.

## ABOUT RADIO WAVES

Electromagnetic waves, such as radio waves, light, and x-rays, travel at the speed of light, which is 186,280 miles (299,792 km) per second, nearly one million times the speed of sound waves.

An electromagnetic force generates electromagnetic waves. Electromagnetic energy leaves its source in straight lines and is called radiation. Light and radio waves are different forms of electromagnetic radiation. The main difference between light waves and radio waves is their frequency. A radio wave frequency is much lower than a light wave

frequency, which means that radio wavelength is longer than light wavelength.

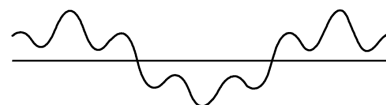


Radio waves consist of rapidly oscillating (varying) electric and magnetic fields. The oscillation rate is called the frequency of the radio wave, and is measured in Hertz (Hz). One Hz equals one oscillation per second; one kilohertz (kHz) equals 1,000 hertz, and one megahertz (million) equals 1000 kHz. The AM (Amplitude Modulation) radio tunes to the standard 520-1720 kHz AM band. The FM (Frequency Modulation) radio tunes to the standard 88-108 MHz FM band. A radio station transmits its program on a set frequency, and you use your radio to tune to the same frequency to receive that program.

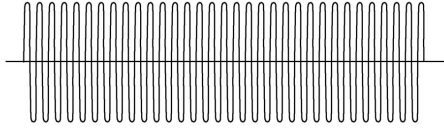
## ABOUT THE RADIO TRANSMITTER

In a radio station, a microphone converts the sound of an announcer's voice into electrical signals where the words are mixed with the station's carrier wave. The mixed signal is then transmitted from the station's transmitting antenna as a broadcast signal wave.

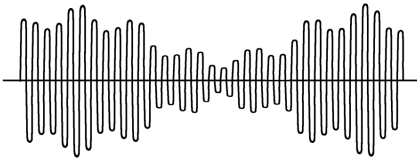
A sound wave might look something like this.



A station's carrier wave might look something like this.



A transmitter combines the sound wave with the carrier wave, looking something like this.



## ABOUT RADIO RECEPTION

When radio waves hit a radio's antenna, they produce tiny oscillating electric currents within the antenna. This current then flows to the tuning circuit (made of the tuning coil and the variable capacitor). You use the AM/FM tuning knob to tune the tuning coil to select a radio frequency corresponding to a particular station. This radio frequency is boosted by the amplifier circuit to drive the speaker, which converts the radio waves into sound waves. See "Circuit Schematic" on Page 18 for a more complete explanation.

## REQUIRED SUPPLIES

You need a pair of diagonal cutting pliers and a Phillips screwdriver to build your AM/FM radio. You also need 4 AA alkaline batteries to operate your radio.



## GETTING STARTED

Make sure all the parts are included in the kit. Check the contents of your kit against

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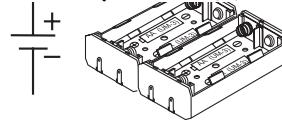
the following Parts List. The parts list is divided into two sections, Electronic Parts (resistors, transistors, and so on) and Mechanical Parts (nuts, spring terminals, wire, and so on). After you check off the parts on the list, return them to their original place in the box so they will not get lost or damaged.

Printed on the radio kit's cardboard panel is a circuit diagram with parts schematic symbols to help you locate the correct part position on the circuit diagram panel. Mount parts on the circuit diagram panel according to their symbol printed on the panel.

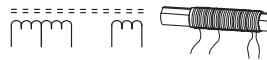
## SUPPLIED PARTS LIST

### Electronic Parts and Symbols

#### ☐ Battery Holder (1)



#### ☐ Antenna Coil, AM (1)



The antenna coil is a coil of wire wrapped around a black ferrite rod. This coil picks up AM radio signals.

#### ☐ Resistor (5)



##### ☐ 2M (1)

##### ☐ 10k (2)

##### ☐ 330k (1)

##### ☐ 4.7k (1)

Resistors are brown tube-shaped parts with color bands around them to help you identify their Ohm value. The values of these resistors are abbreviated, using the letter k to

symbolize 1,000 Ohms and the letter M to symbolize 1,000,000 Ohms. (For example, a 4.7k resistor has a resistance of 4,700 Ohms.)

Resistors oppose the flow of electrons. They are useful in supplying specific voltages to other electronic components. The Ohm value determines how strongly the resistor opposes the electron flow.

To calculate the Ohms value, use the color code below. Turn the resistor so the gold band faces toward the right. The first two colored bands on the left represent the first two numbers, and the third band represents the multiplier.

Color	Value	Multiplier
Black	0	1
Brown	1	10
Red	2	100
Orange	3	1000
Yellow	4	10,000
Green	5	100,000
Blue	6	1,000,000
Violet	7	10,000,000
Gray	8	100,000,000
White	9	1,000,000,000

For example, a resistor with green, blue, orange, and gold bands would have a resistance of 56,000 Ohms (or 56k Ohms).

The following chart shows the color code for tolerance (or accuracy) of a resistor.

Color	Tolerance	Multiplier
None	±20%	0.02
Silver	±10%	0.01
Gold	±5%	0.1

In the example listed above, the resistor's final band indicates that it has a tolerance of ±5%. So the actual resistance of that particular resistor would be 56,000 ±5% (five percent of 56,000 is 2800). Therefore, the actual value is between 53,200 and 58,800 Ohms.

#### ☐ Capacitor (7)



#### Ceramic Capacitors

- ☐ 0.01μF marked 103 (2)
- ☐ 0.05μF marked 503 (2)
- ☐ 0.022μF marked 223 (1)

#### Electrolytic Capacitors

- ☐ 1μF (1)
- ☐ 47μF (1)

Capacitors temporarily store a charge or act as filters to smooth out pulsating signals. They can pass alternating current (AC) signals while blocking direct current (DC) signals. Usually, the negative (-) side is marked on the capacitor. You must always connect the positive (+) terminal of an electrolytic capacitor correctly. Other capacitors (and resistors) can be connected either way.

All capacitors store electrons. This ability to store electrons is known as *capacitance*. Capacitance is measured in farads (F). Large capacitors are measured in microfarads (μF), and small capacitors are measured in picofarads (pF).

1 farad = 1F

1 microfarad = 1μF = 10<sup>-6</sup>F = 0.000001F

1 picofarad = 1pF = 10<sup>-12</sup>F = 0.000000000001F

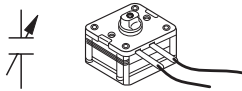
The numbers printed on each capacitor represent its capacitance. The first two numbers on the capacitor are the first two digits

of the capacitance. The third number is the multiplier.

For example, if a capacitor has 223 printed on its body, then:

- the first two digits of its capacitance are 22
- the third digit (3) tells you to add 3 zeros to the first two digits
- the resulting capacitance would be 22,000pF

☐ **Variable Capacitor (AM Tuning Capacitor) (1)**

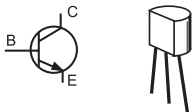


This is a special type of capacitor used with the AM antenna coil to tune the radio to AM frequencies.

☐ **Speaker (1)**



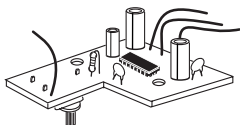
☐ **Transistor (2)**



Your kit's transistors have several uses — to amplify weak signals; to connect or disconnect other components; or to allow signals to flow in pulses.

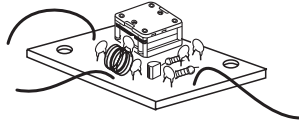
Each transistor has three connection points: B (base), C (collector), and E (emitter).

☐ **Amplifier PCB Assembly (1)**



The amplifier circuits are pre-assembled on a small printed circuit board (PCB). The assembly is used to amplify weak radio signals.

☐ **FM Tuner PCB Assembly (1)**



The FM tuner circuit is pre-assembled on a PCB and is used to tune to the desired FM frequency (station).

**Mechanical Parts**

☐ **Plastic AM Antenna Bracket (1)**



☐ **Metal FM Antenna Bracket (1)**



☐ **FM Loop Antenna (1)**



☐ **Plastic Spacers (7)**



☐ **Spring Terminals (21)**



☐ **Flat AM Tuning Knob (1)**



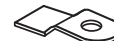
☐ **FM Tuning Knob (1)**



☐ **PVC Tube (1)**

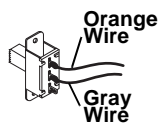


☐ **Speaker Bracket (3)**

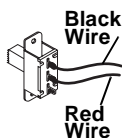


☐ **Green 15 cm Wire (7) (Not Shown)**

☐ **AM/FM Switch (1)**



☐ **ON/OFF Switch (1)**



**Machine Screws:**

☐ **3× 16 mm (2)**



☐ **3×12 mm (3)**



☐ **3×10 mm (3)**



☐ **3×8 mm (3)**



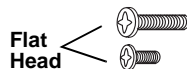
☐ **2.6 × 4 mm (1 )**



☐ **2×6 mm (4)**



☐ **3 × 10 mm (2)**



☐ **2.6 × 4 mm (2)**

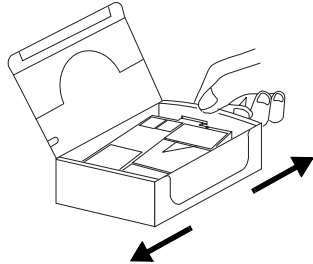


☐ **Nuts with 3 mm Hole (13)**



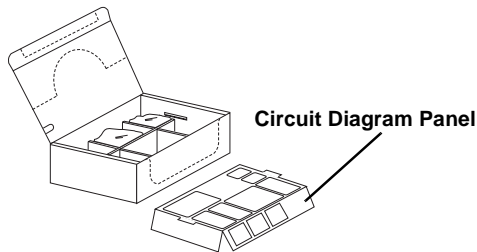
## ASSEMBLY

Open the top cover and stretch out the box's left and right sides. Then grasp the circuit diagram panel and lift it out.



Take out the components from the box as you need them, but leave the partition inside.

Do not return the circuit diagram panel to the box for the time being. You will mount the components on it.



**Hint:** Unless otherwise directed, insert all components from the *top* of the circuit diagram panel.

### MOUNTING COMPONENTS ON THE CIRCUIT DIAGRAM PANEL

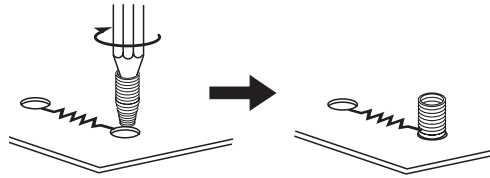
Many connections will be made on the back-side of the circuit diagram panel. Write down the number of each spring terminal on the back side of the panel. Refer to the "AM/FM Circuit Diagram and Explanation" on Page 18. Be sure to do this accurately.

### Mounting the Spring Terminals

Spring terminals provide an easy way to make electrical connections without soldering.

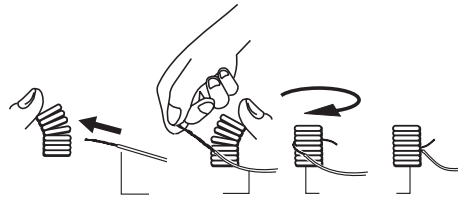
There are 21 spring terminal holes numbered with 1 to 21 on the circuit diagram panel.

Insert the small end of a spring terminal into a terminal hole and press down until it clicks. To make sure that the spring terminals are securely installed, use the pointed end of a pencil to push the spring terminal down. Then slightly twist the pencil in the spring terminal. Allow the terminal to extend approximately  $\frac{2}{3}$  of its length above the circuit diagram panel.



### WIRE CONNECTION ON THE CIRCUIT DIAGRAM PANEL

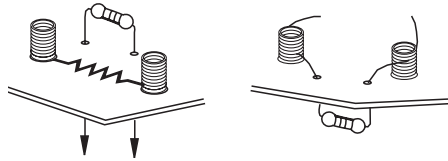
To make the wire connections, bend the spring terminal to one side using your finger, and insert only the lead (not the plastic-covered part of the wire) between the spring terminal's coils. Allow the spring terminal to return to its original position as it holds the lead in place, making a good connection.



Make the first connections close to the spring terminal's base, leaving room for other connections to be made later.



## MOUNTING THE RESISTORS



1. Grasp the 2M Ohm resistor (with red, black, green, and gold colored bands around it) and slightly bend the two wire leads so they fit into the two holes marked 2M in the DETECTOR section of the circuit panel.

Press each resistor all the way down so it is flush with the panel.

2. Turn the panel over and insert the resistor's two leads into Terminals 8 and 12 as directed in "Wire Connection on the Circuit Diagram Panel" on Page 8.

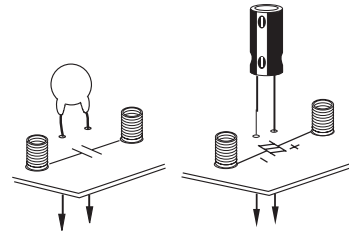
Be sure that the resistors only contact the specified terminals.

3. Grasp a 10k Ohm resistor (with brown, black, orange, and gold bands) and bend its two leads so it fits in the two holes marked 10k on the PREAMPLIFIER section of the circuit panel.
4. Turn the panel over and insert the resistor's two leads into Terminals 13 and 15.
5. Bend the other 10k Ohm resistor's leads in the same manner and insert them into the two holes marked 10k on the top portion of the PREAMPLIFIER section of the circuit panel.
6. Turn the panel over and insert the resistor's two leads into Terminals 17 and 20.
7. Grasp the 4.7k Ohm resistor (with yellow, violet, red, and gold bands) and bend its two leads so it fits in the two holes marked 4.7k on the PREAMPLIFIER section of the circuit panel.
8. Turn the panel over and insert the resistor's two leads into Terminals 17 and 18.
9. Grasp the 330k Ohm resistor (with orange, orange, yellow, and gold bands)

and bend its two leads so it fits in the two holes marked 330k on the PREAMPLIFIER section of the circuit panel.

10. Turn the panel over and insert the resistor's two leads into Terminals 16 and 18.

## MOUNTING THE CAPACITORS



1. Insert a 0.05 $\mu$ F ceramic capacitor's (marked 503) leads into the two holes marked 0.05 $\mu$ F on the DETECTOR section of the circuit panel.
2. Turn the panel over and insert the capacitor's two leads into Terminals 8 and 9.
3. Insert the other 0.05 $\mu$ F ceramic capacitor's leads into the two holes marked 0.05 $\mu$ F on the PREAMPLIFIER section of the circuit panel.
4. Turn the panel over and insert the capacitor's two leads into Terminals 14 and 15.
5. Insert a 0.01 $\mu$ F ceramic capacitor's (marked 103) leads into the two holes marked 0.01 $\mu$ F on the DETECTOR section of the circuit panel.
6. Turn the panel over and insert the capacitor's two leads into Terminals 11 and 12.
7. Insert the other 0.01 $\mu$ F ceramic capacitor's leads into the two holes marked 0.01 $\mu$ F on the PREAMPLIFIER section of the circuit panel.
8. Turn the panel over and insert the capacitor's two leads into Terminals 18 and 19.

9. Insert the  $0.022\mu\text{F}$  ceramic capacitor's (marked 223) leads into the two holes marked  $0.022\mu\text{F}$  on the **PREAMPLIFIER** section of the circuit panel.
10. Turn the panel over and insert the capacitor's two leads into Terminals 18 and 21.
11. The remaining two capacitors are electrolytic and have positive (+) and negative (-) leads. The shorter lead near the vertical stripe on the side of the electrolytic capacitor is the negative terminal, and the opposite longer lead is the positive terminal.

When inserting the electrolytic capacitor into the panel, be sure that the positive (+) and negative (-) leads match the schematic diagram.

Insert the  $1\mu\text{F}$  electrolytic capacitor's leads into the two holes, marked  $1\mu\text{F}$  on the **PREAMPLIFIER** section of the circuit panel so the longer lead is in the + hole.

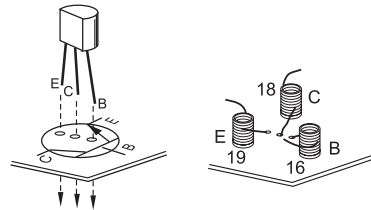
12. Turn the panel over and insert the capacitor's longer, positive (+) lead into terminal 15 and the shorter, negative (-) lead into Terminal 16.
13. Insert the  $47\mu\text{F}$  electrolytic capacitor's leads into the two holes, marked  $47\mu\text{F}$  on the **PREAMPLIFIER** section of the circuit panel so the longer lead is in the + hole.
14. Turn the panel over and insert the capacitor's longer, positive (+) lead into Terminal 13 and the shorter, negative (-) lead into Terminal 14.



**STOP!** Go back and *carefully* check your work. Be sure that you have mounted each part into the correct holes on the panel and that the leads are connected to the correct spring terminal numbers. Also, make sure that the electrolytic capacitors are installed with the positive and negative leads in the correct position.


Use the diagonal wire cutters to trim the resistors' and capacitors' excess wire ends (that extend *beyond* the spring terminals) from the bottom of the panel. Do not cut the connections to the electronic components, though!

## MOUNTING THE TRANSISTORS



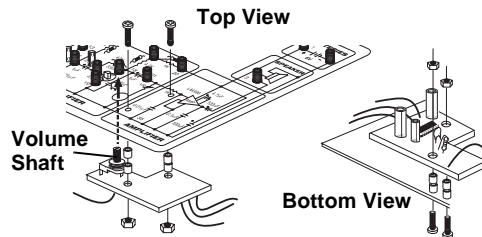
Each transistor has three leads, and each lead must go into the correct hole in the circuit diagram panel. Hold the transistor with the flat side facing you and the leads pointing down. The left lead is the emitter (E), the center is the collector (C), and the right lead is the base (B).

**Important!** A transistor will not function if its leads are installed incorrectly. Make sure that each lead is installed in the correct hole in the panel, and that the connections are made to the correct spring terminals.

1. Position the transistor so the flat side faces Terminal 10 and insert the leads into the holes in the center of the  symbol in the **DETECTOR** section of the circuit panel.
2. Turn the panel over and insert the emitter lead to Terminal 11, the center lead to Terminal 10, and the base lead to Terminal 8.

3. Position the other transistor so the flat side faces Terminal 18 and insert the leads into the holes in the center of the  $\odot$  symbol in the **PREAMPLIFIER** section of the circuit panel.
4. Turn the panel over and insert the emitter lead to Terminal 19, the center lead to Terminal 18, and the base lead to Terminal 16.

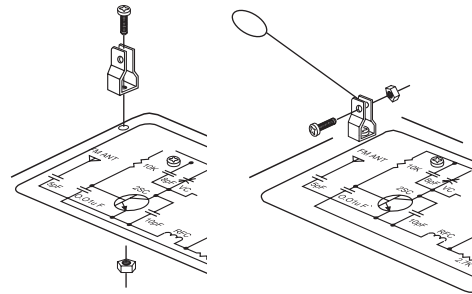
## MOUNTING THE AMPLIFIER PCB ASSEMBLY



**Caution!** Use extreme care when you handle and mount a PCB assembly. Hold it only by the edges; avoid touching any parts on the PCB assembly.

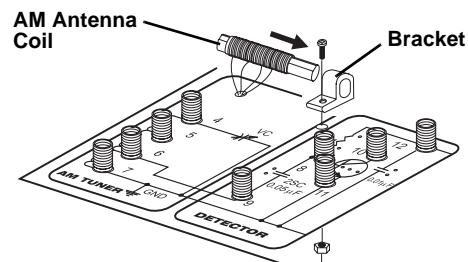
1. Insert two 3×16 mm screws into the two holes between the **PREAMPLIFIER** and **AMPLIFIER** sections of the circuit panel.
2. Turn the panel over and insert two plastic spacers on both screws.
3. Grasp the amplifier PCB assembly and position it so it fits over the two screws and the volume shaft fits through the hole in the circuit panel in the **PREAMPLIFIER** section of the circuit panel, as shown in the illustration.
4. Fasten a nut to each screw and tighten them to secure the assembly to the circuit panel.
5. Connect the amplifier's four wires under the circuit panel as follows:
  - black to Terminal 19
  - yellow to Terminal 21
  - blue to Terminal 3
  - red to Terminal 20

## MOUNTING THE FM LOOP ANTENNA



1. Insert a 3×8 mm screw into the screw hole on the metal antenna bracket, then insert the screw through the hole on the upper left of the **FM TUNER** section of the circuit panel.
2. Turn the panel over and fasten a nut on the screw and tighten it slightly to secure the antenna bracket. Do not fasten the nut all the way. You will finish the connection in Step 4 under "Mounting the FM Tuner PCB Assembly" on Page 12.
3. Turn the panel over and insert the smaller loop of the loop antenna into the antenna bracket. Align the loop with the screw holes on the bracket, then insert a 3×8 mm screw through the screw holes and the small loop.
4. Fasten a nut to the screw and tighten it.

## MOUNTING THE AM ANTENNA COIL BAR



1. Slide the white plastic bracket over the AM antenna coil's end that has the most

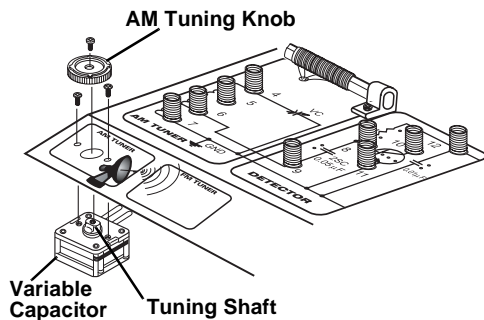
- room. The antenna bar should fit snugly in the bracket.
- Position the AM antenna on the **AM TUNER** section of the circuit panel and insert the antenna's four wires through the small hole.
  - Place a 3×8 mm screw through the hole in the bracket and the circuit panel (between the **AM TUNER** and the **DETECTOR** sections of the circuit panel).
  - Turn the panel over and fasten a nut to the screw to mount the antenna to the circuit panel.
  - Connect the four wires from the antenna coil under the circuit panel as follows:
    - green to Terminal 6
    - red to Terminal 7
    - black to Terminal 5
    - white (or light color) to Terminal 4

- Insert the two 2.6×4 flat head screws into the two small screw holes on the **AM TUNER** panel and tighten them to fasten the variable capacitor to the panel.
- Position the tuning knob over the variable capacitor's tuning shaft so that if the **AM TUNER** panel were a clock, the white dot on the knob would point to 9.
- Insert a 2.6 ×4 mm screw into the tuning knob and tighten it to fasten the tuning knob to the tuning shaft.
- Turn the circuit diagram panel over and connect the tuning capacitor's longer wire lead to Terminal 4 and the other to Terminal 7.

Make sure that these bare wires do not contact any other spring terminals.

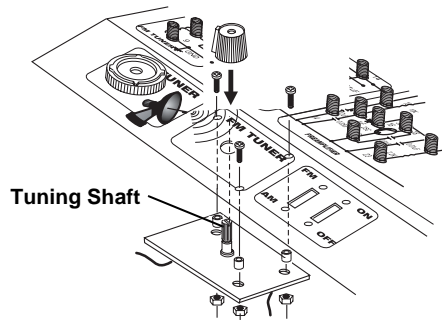
- Trim the variable capacitor's excess wire ends (that extend *beyond* the spring terminals) with the diagonal cutters.

## MOUNTING THE AM TUNING CAPACITOR



- Hold the variable capacitor so the tuning shaft faces you and the two leads are pointing up.
- Rotate the variable capacitor's tuning shaft counterclockwise (left) until it stops.
- Insert the AM tuning capacitor's tuning shaft from the bottom of the circuit diagram panel through the large hole on the **AM TUNER** panel as shown.

## MOUNTING THE FM TUNER PCB ASSEMBLY



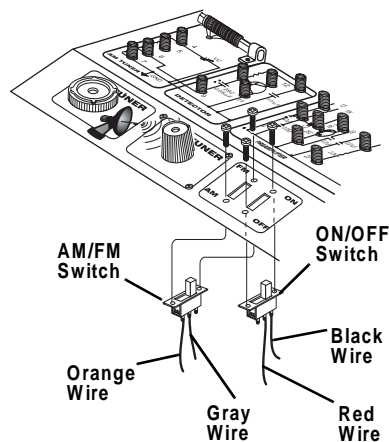
**Caution!** Use extreme care when you handle and mount this PCB assembly. Hold the circuit board only by its edges and avoid touching any parts on the PCB.

- Insert the three 3×12 mm screws from the top into the three holes on the **FM TUNER** panel, then turn the panel over and place a plastic spacer onto each of the three screws.
- Align the three screw holes on the FM tuner PCB assembly with the three

screws you just mounted on the panel, then fasten a nut onto each screw so the assembly is secured to the panel.

3. Rotate the FM tuner PCB's tuning shaft counterclockwise (left) until it stops. Position the FM tuning knob over the tuning shaft so that if the FM TUNER panel were a clock, the pointer would point to 9. Press the knob down all the way onto the tuning shaft.
4. Turn the panel over and connect the FM tuner PCB's white wire to the FM loop antenna bracket's screw, then tighten the nut.
5. Connect the black wire to spring Terminal 14.

## MOUNTING THE AM/FM AND ON/OFF SWITCHES



1. Position the AM/FM switch (the one with orange and gray wires) beneath the FM/AM panel as shown in the illustration. The wires *must* be positioned as shown.
2. Align the switch's screw holes with those in the FM/AM panel and insert two 2x6 mm screws into the holes. Tighten the screws to fasten the switch to the FM/AM panel.
3. Position the ON/OFF switch (the one with red and black wires) beneath the ON/OFF panel as shown in the illustration.

tion. The wires *must* be positioned as shown.

4. Align the switch's screw holes with those in the ON/OFF panel and insert two 2x6 mm screws into the holes. Tighten the screws to fasten the switch to the ON/OFF panel.
5. Turn the panel over and connect the switches' wires as follows:

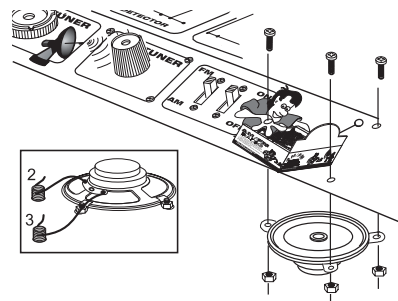
### AM/FM Switch:

- orange to Terminal 10
- gray to Terminal 15

### ON/OFF Switch:

- red to Terminal 20
- black to Terminal 1

## MOUNTING THE SPEAKER

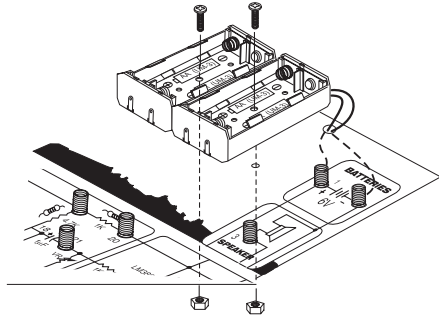


1. Insert three 3x10 mm screws through the three holes in the speaker section of the panel (to the right of the ON/OFF section).
2. Turn the panel over and slide the three speaker brackets over the screws.
3. Fasten three nuts to the screws and tighten them slightly. Do not tighten them all the way.
4. Set the speaker, flat side down, in the middle of the three brackets.
5. Swivel the brackets so they face toward the center of the speaker and then tighten the nuts to secure the speaker to the panel.



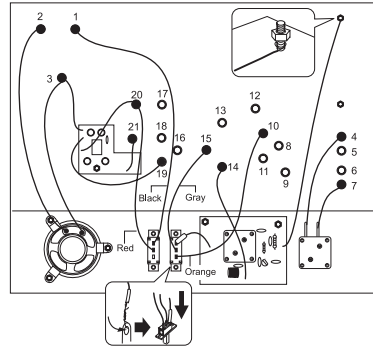
6. Connect the blue speaker wire to spring Terminal 2 and the red speaker wire to spring Terminal 3.

## MOUNTING THE BATTERY CASE



1. Insert the battery case's black and red wires (as shown) into the wire hole next to the **BATTERIES** section of the circuit panel.
2. Place the battery case to the left of the **BATTERIES** section of the circuit panel (as shown) and align the battery case's two screw holes with the two screw holes on the panel.
3. Insert two flat head 3×10 mm screws into the screw holes in the battery case.
4. Turn the panel over and fasten two nuts onto the screws to secure the battery case to the circuit diagram panel.
5. Connect the battery case's red wire to Terminal 1.
6. Connect the battery case's black wire to Terminal 2.

## CONNECTING THE WIRES UNDER THE DIAGRAM PANEL



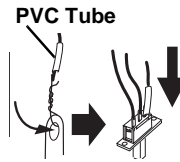
Turn the circuit diagram panel over and verify that the following connections have been made:

### 1. AM Tuning Capacitor:

- short white wire to Terminal 7
- long white wire to Terminal 4

### 2. FM Tuner PCB Assembly:

- black wire to Terminal 14
- white wire to antenna screw
- Insert the red wire into the PVC tube (as shown), then insert the red wire through the loop on the **AM/FM** switch. (Refer to the illustration above.) Bend the lead back toward the red wire, then slide the PVC tube down to secure the connection.



### 3. AM/FM Switch:

- orange wire to Terminal 10
- gray wire to Terminal 15

### 4. ON/OFF Switch:

- red wire to Terminal 20
- black wire to Terminal 1

### 5. Speaker:

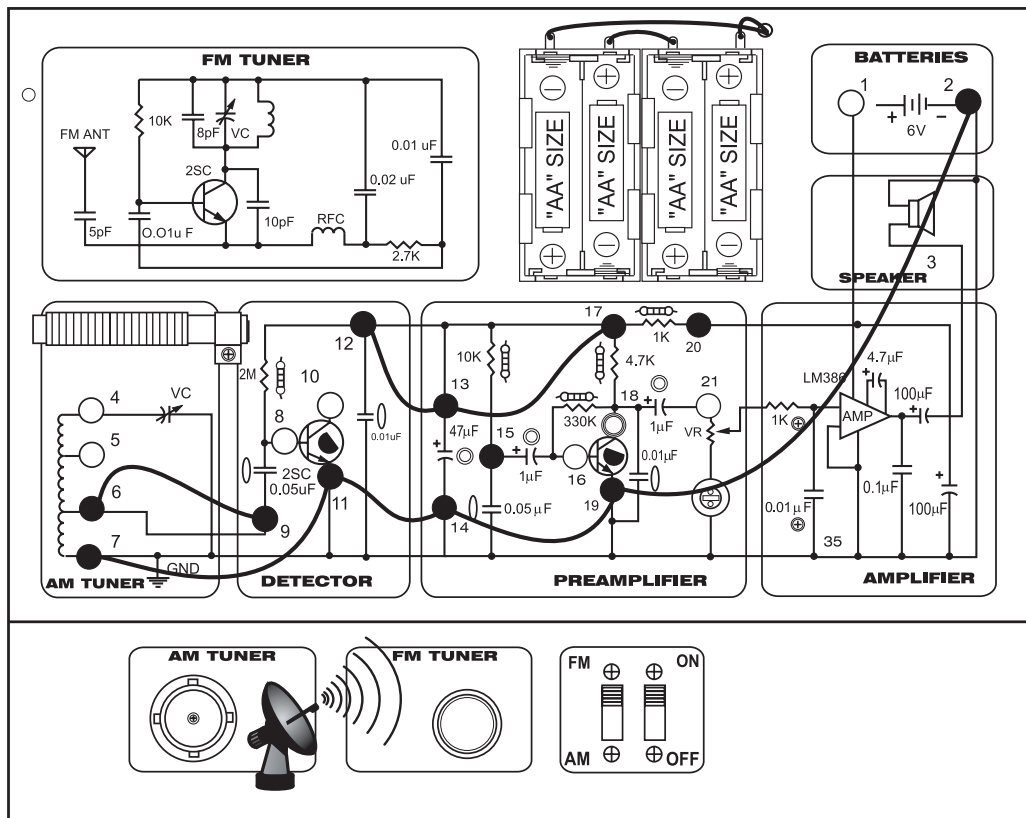
- blue wire to Terminal 2
- red wire to Terminal 3

## 6. Amplifier PCB Assembly:

- yellow wire to Terminal 21
- black wire to Terminal 19
- red wire to Terminal 20
- blue wire to Terminal 3

## WIRING

Your radio kit includes green wire for completing the circuit on top of the circuit diagram panel. Following the wiring diagram (shown here), and using the supplied wire, insert wire leads into the indicated terminal combinations. Check off the terminal pairs as you go to make sure you complete each connection.



- ☐ Terminals 2 and 19
- ☐ Terminals 11 and 7
- ☐ Terminals 6 and 9

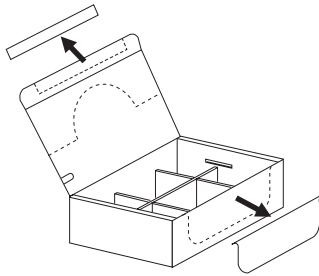
- ☐ Terminals 19 and 14
- ☐ Terminals 12 and 13

- ☐ Terminals 14 and 11
- ☐ Terminals 13 and 17

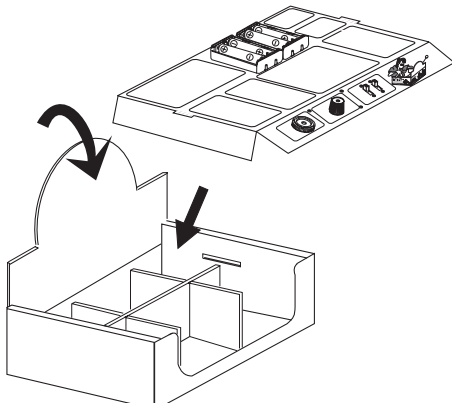
## FORMING THE RADIO KIT BOX

After you complete all connections on the circuit diagram panel board, compare your work with the wiring diagram to make sure that all the connections are correct. Then follow these steps to form the radio kit box.

1. Tear off the two pre-cut panels on the box as shown.



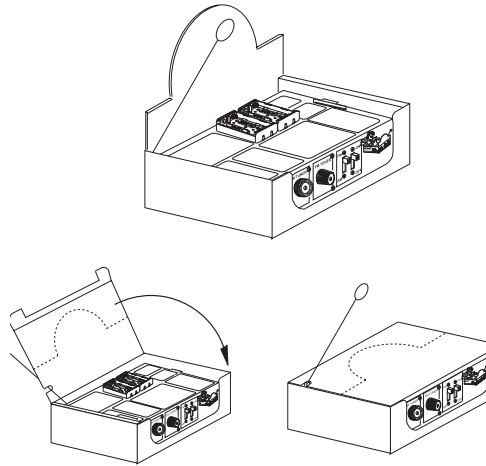
2. Bend the four flaps on the circuit diagram panel and position the control panel with the AM and FM tuning knobs at the front (as shown), then insert the circuit diagram panel into the box.



3. Stretch out the left and right panels of the box, then insert the tabs at the left and right side of the circuit diagram panel into the slots at the left and right panel of the box.
4. You can either open the top cover to show the components on the circuit board or close the top cover to hide the components (after you install the batteries). To close the top cover, tilt the FM

loop antenna left so the FM antenna fits into the antenna slot, as shown.

5. Position the FM loop antenna straight up.



## INSTALLING BATTERIES

Your AM/FM Radio Kit requires four AA batteries (not supplied) for power. For the best performance and longest life, we recommend RadioShack alkaline batteries.

### Cautions:

- Use only fresh batteries of the required size and recommended type.
- Do not mix old and new batteries, different types of batteries (standard, alkaline, or rechargeable), or rechargeable batteries of different capacities.

Install the batteries according to the polarity (+ and -) marked inside the battery case.

When the reception becomes weak or the radio stops operating properly, replace the batteries.

**Warning:** Dispose of old batteries promptly and properly. Do not burn or bury them.

**Caution:** If you do not plan to use the radio for a month or longer, remove the batteries. Batteries can leak chemicals that can destroy electronic parts.



## OPERATION

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### TO LISTEN TO THE AM RADIO

1. Set **ON/OFF** to **ON**.
2. Set **AM/FM** to **AM**.
3. Rotate the **AM** tuner knob until you tune to the desired frequency.
4. Adjust the volume control (on the **PREAMPLIFIER** section of the circuit diagram panel) to the desired listening level.

For the best **AM** reception, rotate the radio kit box until you hear a clear transmission.

5. When you finish, set **ON/OFF** to **OFF** to turn off the radio and conserve battery power.

### TO LISTEN TO THE FM RADIO

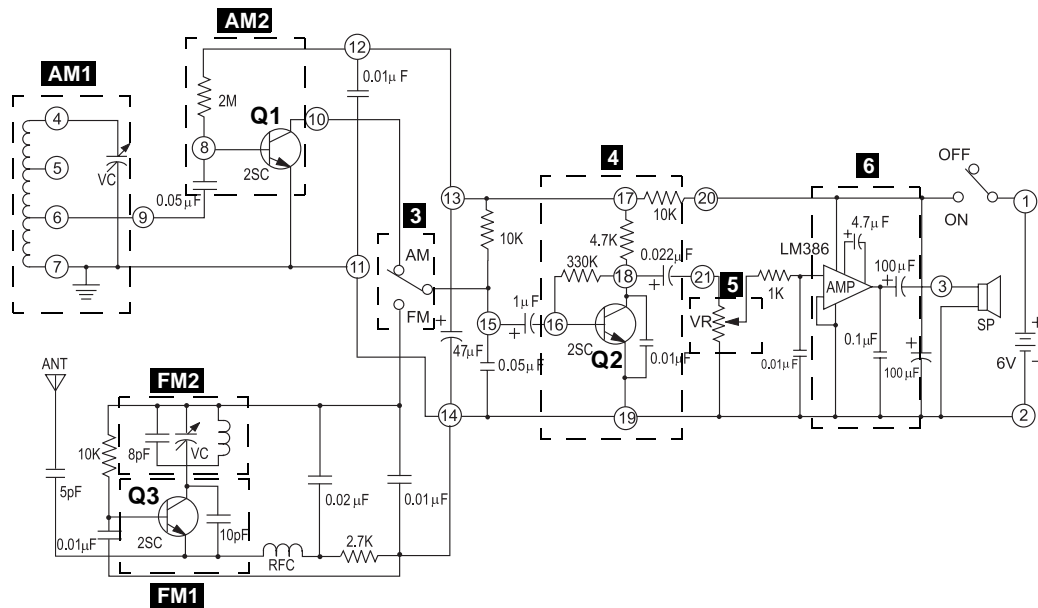
1. Set **ON/OFF** to **ON**.
2. Set **AM/FM** switch to **FM**.
3. Rotate the **FM** tuner knob to tune to the desired frequency.
4. Adjust the volume control (on the **PREAMPLIFIER** section of the circuit diagram panel) to the desired listening level.

For the best **FM** reception, rotate the **FM** loop antenna until you hear a clear transmission.

5. When you finish, set **ON/OFF** to **OFF** to turn off the radio and conserve battery power.

# CIRCUIT SCHEMATIC

## AM/FM CIRCUIT DIAGRAM AND EXPLANATION



As you recall from the Introduction, radio waves are electromagnetic waves that pass through the air. The diagram above describes how radio signals are received and processed. If the radio wave is between 570-1720 kHz, then it is AM, and the AM antenna picks it up (AM1 and AM2). If the radio wave is between 88-108 MHz, then it is FM, and the FM antenna picks it up (FM1 and FM2). "Completing the Circuit" (3-6) describes the remainder of the process, which is the same for both AM and FM signals.

### AM Circuit Operation

**AM1** — The AM tuner circuit, which includes the coil and the tuning capacitor, selects a tuning frequency, filtering out other frequencies.

**AM2** — The Q1 transistor circuit amplifies the tuned frequency.

### FM Circuit Operation

**FM1** — The FM antenna receives a signal. The Q3 transistor circuit amplifies the weak signal.

**FM2** — The FM tuner circuit, which includes the tuning capacitor, selects a tuning frequency, filtering out other frequencies.

### Completing the Circuit

**3** — Your radio picks up a signal and passes it to the AM/FM selector switch.

**4** — From the AM/FM switch, the signal is transferred to the Q2 transistor circuit which amplifies weak signals.

**5** — From the Q2 transistor circuit, the signal is passed to the variable resistor circuit which lets you adjust the volume.

**6** — From the variable resistor circuit, the signal is transferred to the amplifier circuit, amplified, then transmitted to the speaker as sound.

## TROUBLESHOOTING

If your radio does not pick up a strong signal, or if you do not hear anything, these suggestions might help you figure out the problem and fix it. If your radio still does not operate properly, take it to your local RadioShack store for assistance.

Problem	Solution
The radio does not work.	Install fresh batteries.
	Check to make sure all of the connections (above and below the circuit diagram panel) are made to the correct spring terminals.
	Make sure you placed the correct resistor and capacitor values and connected them to the correct spring terminals.
	Make sure that the transistors are correctly placed and connected to the correct spring terminals.
The reception is poor.	For FM stations, rotate the FM antenna.
	For AM stations, rotate the radio.
	For both AM and FM stations, move the radio away from TVs, CBs, stereos, or other devices which might interfere with reception.

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